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*Massachusetts
Technology
Development
Corporation*

*Annual Report
1981*



Cover:
Photographic magnification of a
CRT video monitor displaying
alphanumeric characters.

The Massachusetts Technology Development Corporation is an independent public agency which provides venture capital financing to early-stage, high-risk technology-based companies in Massachusetts. MTDC was chartered by act of the state legislature in late 1978, and began operating its first investment fund in March 1979.

The purpose of MTDC is to provide a source of capital to new and expanding high technology enterprises which have the capacity to generate significant employment growth and other public benefits but which have been unable to secure from conventional sources sufficient affordable capital to fund such expansion adequately.

The capitalization of MTDC's investment funds is provided in part by the Commonwealth of Massachusetts, in part by the U.S. Department of Commerce, and in part by earnings on the investments in the portfolio.

MTDC is an independent corporation whose operations are supervised by an eleven person Board of Directors, composed of six individuals from the private sector, two individuals from the university community, and three senior public officials. The organization is a public instrumentality and is not a for-profit corporation.

Report of the Chairman and President

The year ended June 30, 1981, which was MTDC's second full year of operation, brought four very satisfying accomplishments. When added to the foundation established during the prior year, these accomplishments solidified MTDC's role as a significant and positive force in the expansion of technology-based companies in the state's vitally important small business sector.

The first accomplishment was the successful expansion of MTDC's portfolio into new areas of the high technology industries, thereby helping to develop in Massachusetts some extremely innovative technologies which have not previously played a very visible role in the state's industrial climate. To achieve this goal, MTDC extended financing to companies in the materials science, avionics and automation industries, in each case as part of a syndication involving private sector investors who relied on MTDC to lead the way.

Our second accomplishment involved the recapitalization of our investment fund. With most of our original capital either invested or under commitment, new funding was essential and it was achieved in a rather interesting way. In the late summer of 1980, the U.S. Department of Commerce issued a request for proposals in a national competition among the 50 states for grant funds to finance the kind of activities MTDC had pioneered the previous year. MTDC submitted a proposal on behalf of the Commonwealth of Massachusetts. After a vigorously-fought competition and an arduous review process, MTDC was named one of the four winners and was awarded a one million dollar grant by the Department. Subsequently, the state legislature voted to match the federal grant with an additional one million dollars so MTDC could maintain the level of investment activity it had established. The capital from these two sources will be pooled in a new investment fund from which combination debt and equity investments will be made in start-up companies.



William F. Aikman and Marvin G. Schorr

Our third major accomplishment involved our first experience with a troubled company in the portfolio. A start-up company which we had financed ran into serious difficulties early in the year. The staff worked closely with the company to try various methods of working the financial problems out and preserving the technology. When none of these methods seemed likely to produce success, we offered our services as an intermediary between the company and other corporations potentially interested in acquiring its business. Eventually, these efforts met with success and we were able to facilitate the acquisition of the assets of the company in a transaction that returned MTDC's capital with a respectable return and which shows promise of enabling the innovative ideas to be carried forward successfully. The proceeds of that transaction have now been revolved back into our fund for further investment to other companies.

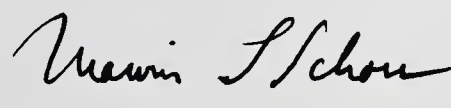
Our last major accomplishment is really a function of all the others. We have now clearly demonstrated the very cost-effective role a publicly-financed venture capital organization can play in the rapid development of the state's technology-based small businesses. The \$1.55 million MTDC had invested in its portfolio companies by year end has leveraged a total of \$11,025,000 in investment by conventional private sector sources in the same companies. In the aggregate, our portfolio companies estimate that they will create directly almost 1,000 new jobs. The number of additional jobs created in Massachusetts indirectly as a result of portfolio companies' growth is estimated to be approximately 1,400. The additional tax revenues paid to the Commonwealth during the last fiscal year as a result of this growth are estimated to be close to half a million dollars. Several of the companies have made a double contribution to the state's health by running training programs which result in the hiring of people formerly dependent on public assistance programs. Without even considering this last factor, the public cost per job created by MTDC is

approximately \$1,693, a figure which is remarkably low compared to all other public job creation activities.

The staff's efforts to produce the results outlined above have benefitted enormously from the wise counsel of an exceptionally able and dedicated Board of Directors. At year's end, the Governor notified us of his intention to reappoint three Directors whose terms of office were about to expire and who have served the organization with distinction: Joe B. Wyatt, Vice President for Administration of Harvard University, who serves as Vice Chairman of the MTDC Board and Chairman of its Investment Advisory Committee; Dr. Robert C. Seamans, Jr., Dean of the School of Engineering at Massachusetts Institute of Technology, who serves on the Board's Investment Advisory Committee; and Dr. Judith H. Obermayer, Vice President of Research and Planning, Inc., who chairs the Board's Policy Committee.

With the continued assistance of the entire Board and staff as well as with the exceptional support which the Administration has provided, we anticipate the coming year will bring even more accomplishments than the last one brought.

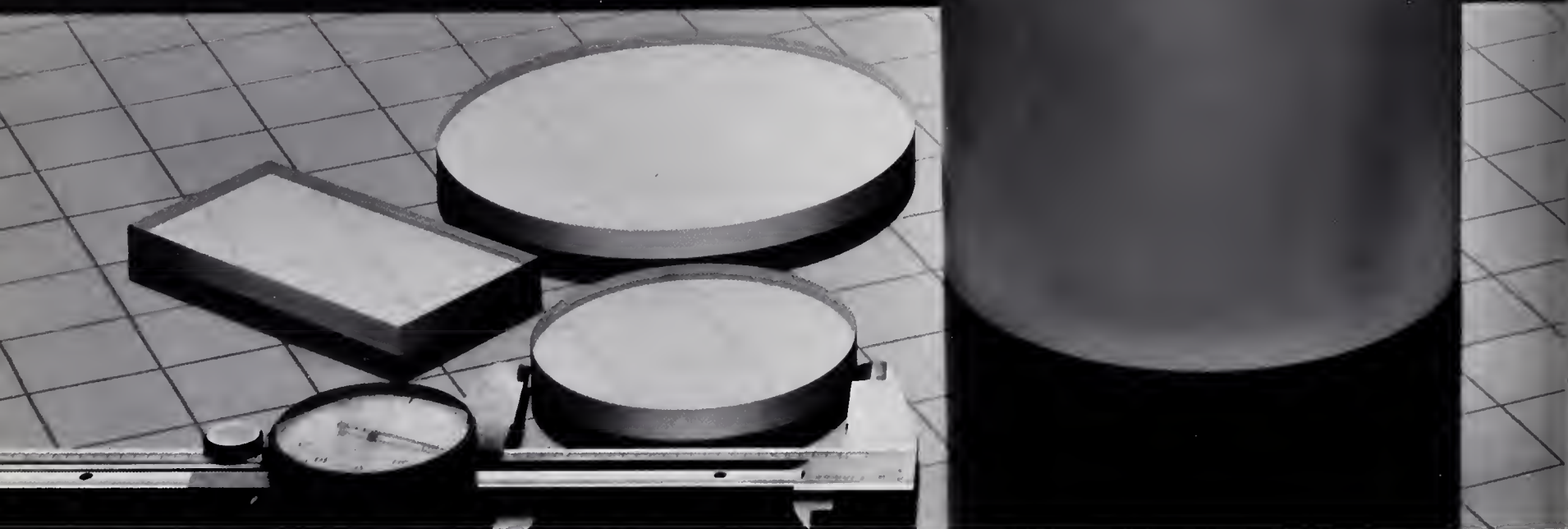
October 1, 1981



Marvin G. Schorr
Chairman



William F. Aikman
President



Located in the historic Salem Harbor area, Crystal Systems began operations in 1972 and since then has developed and patented an advanced crystal growth technology called the Heat Exchanger Method (HEM).

Single crystal sapphire windows used for optical applications, and a Sapphire Maser Cavity used for establishing time standards.

The patented Heat Exchanger Method uses a graphite-resistant furnace, which removes heat from a seed crystal by circulating a controlled flow of helium gas through the heat exchanger. With the development of such a unique capability, Crystal Systems has become renowned for producing the world's purest synthetic sapphire. The company sells its sapphire crystal to the optical, defense and electronics industries.

Recently, the company has further advanced this technology to produce a cost-effective silicon material available for commercial photovoltaic (the science of turning sunlight into electricity) applications. In addition, the company is working on a Fixed Abrasive Slicing Technique (FAST). This high-speed

slicing process is the most advanced cost-effective method of producing silicon wafers. Under the continuing direction of founder Frederick Schmid, the company's current goal is to reach sales of the solar silicon product of \$6.25 million by 1983 and to create approximately 40 new jobs in the process.

After concluding that the company was in a unique position to fill a rapidly expanding market, MTDC decided to invest \$250,000 in the firm. The MTDC loan helped to secure a \$500,000 investment from the Massachusetts Capital Resource Company as well as a \$575,000 increase in the company's line of credit from one of Boston's major commercial banks.

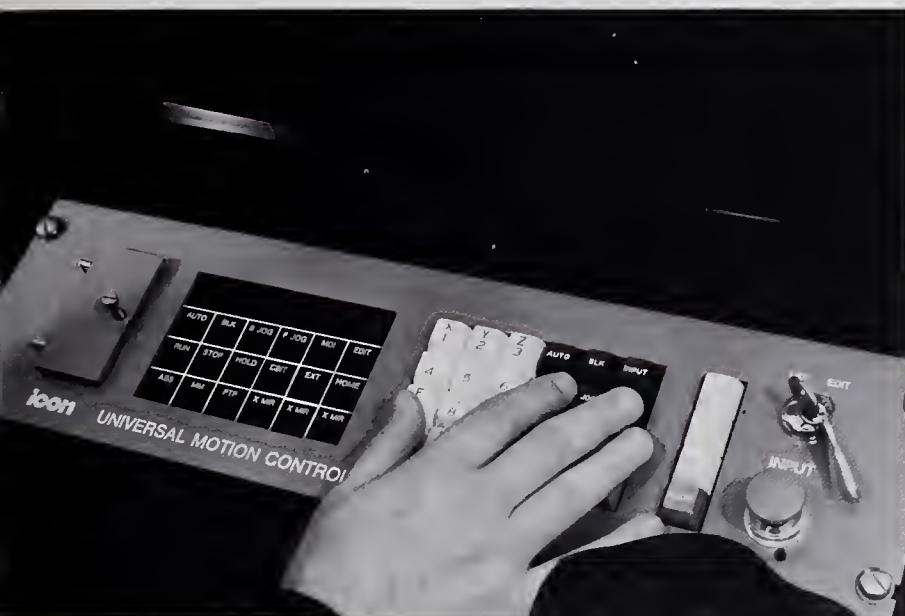
Icon Corporation

Concern over worker productivity has progressed from an issue which was of interest only to major industries in the 1970's to the status of a general business goal in the 1980's. With the foresight to see this trend, Patrick J. Clancy, intent on meeting the challenge of increasing industrial output in the maturing electronics industry, purchased the Icon division from U.S.M. Corporation in February 1977. Located in East Cambridge, the company began marketing its sophisticated set of digital electronic devices in the computer-controlled incremental motion systems business.

The primary market for Icon's incremental motion systems is composed of businesses which are interested in automating their manufacturing and assembly operations but which can do so only if the automated system produces highly precise results. The unique positioning method of Icon's system satisfies this need for precision by moving a variety of components in prescribed patterns at high speeds with a very high degree of accuracy. Typical applications for Icon's system includes automatic pin and component insertion for printed circuit boards, glue and epoxy dispensers and the positioning of medical diagnostic equipment.

Recognizing the potential of such a system, MTDC invested \$150,000 in Icon in a co-venture with the Massachusetts Business Development Corporation which provided an additional \$300,000 in capital. With this new capital, the company was able to secure additional financing from its commercial bank, the New England Merchants Bank.

Icon will use its new capital to expand its marketing capabilities and to finance expected sales of \$3.7 million which should almost triple its workforce by the end of 1982.



Icon's 830 3-Axis Programmable motion control system.



Icon employee assembling a section of the Incremental Motion System.

Pacer Systems, Inc.

Under the leadership of President John Rennie, Pacer Systems of Burlington developed an outstanding reputation in the commercial and military aviation industries for its expertise and high quality work in the manufacture of aviation hardware and in professional consulting services.

Recognizing the increasing use of helicopters for both military and commercial uses, the company's management team sought an infusion of working capital to manufacture and market a major new hardware product, the Omnidirectional Air Data System (OADS). This unique device provides the technology necessary to measure air speed accurately when an aircraft is traveling at speeds below 60 knots. The company's OADS is also the first instrument capable of providing precise measurements of the lateral and reverse speeds of an aircraft.

Pacer also produces a line of intermediate-sized flight simulators. These advanced microprocessor-based navigational systems are already being successfully marketed both nationally and internationally.

In June 1981, MTDC invested \$200,000 in this company, which helped to attract an investment of \$300,000 from the Massachusetts Business Development Corporation and a \$500,000 line of credit from the Shawmut Bank of Boston.

With this investment by MTDC, Pacer Systems will be better able to achieve its goals of \$23 million in sales and a work force of nearly 400 people by 1984.



Pacer's Shorts 330 Flight Simulator.

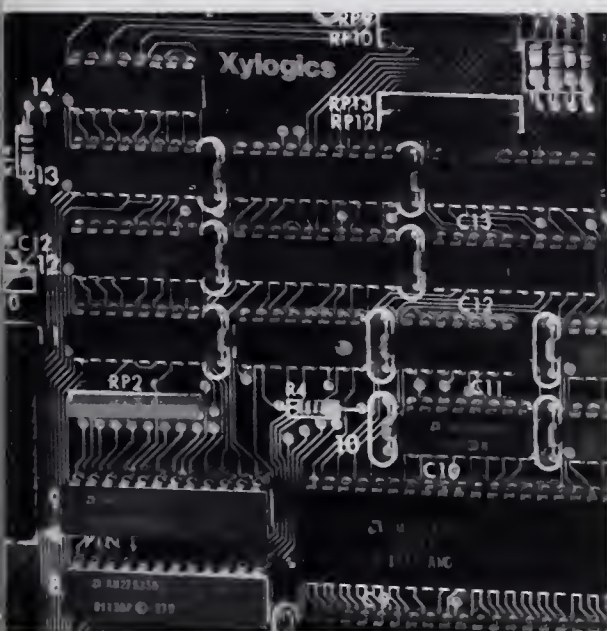


Close-up view of the HH-65 Omnidirectional Air Data Sensor.

Xylogics, Inc.



XL 2300 Microcomputer System utilizing DEC's LSI-11/23 Microprocessor and software products.



Enlarged section of Xylogics' NSI Winchester 533 Peripheral Processor.

Xylogics' sales for 1981 passed the \$10,000,000 mark and are expected to grow very substantially in the next fiscal year. With future expansion in mind, the Burlington firm acquired a new Corporate Headquarters facility this year to handle sales, customer support, finance and final system packaging. The previous headquarters building located near-by will continue to house the manufacturing and engineering departments.

Since our last report, Xylogics has secured a \$1,000,000 infusion of capital from a Swiss-based international venture capital firm and has also more than doubled its bank line of credit with the First National Bank of Boston. These financial developments will enable Xylogics to continue as a leader in the design, manufacture and marketing of highly intelligent emulating peripheral processors, disk and tape storage systems and complete 16 bit micro-computer systems.

Display Components, Inc.



One of Discom's special purpose yokes used in Sonar Systems by the U.S. Navy.



Discom's highly repeatable commercial slator yoke.

Discom's rapidly increasing business culminated in a September 1981 move into a new million-dollar building located in the town of Westford, Massachusetts. The new facility already has enabled the company to substantially upgrade its client list as well as to make room for a significantly larger workforce. The company has recently added

to its customer base such major new purchasers as Xerox, Motorola and Digital Equipment Corporation. The Company is now certain it will meet its original projections of \$11.5 million in sales and 200 new jobs by 1983.

Discom's success provides a clear example of MTDC's role as a catalyst for growth. At the time MTDC invested in this company, DISCOM had only a \$350,000 secured line of credit with a commercial bank. MTDC's \$250,000 investment leveraged a \$420,000 investment from a major venture capital firm and a new \$500,000 unsecured line of credit with the Worcester County National Bank. These capital infusions provided DISCOM with the necessary financial strength to expand its business rapidly.

Spire Corporation

This very innovative solar energy company was the first company in MTDC's portfolio. With the additional working capital provided by MTDC and our co-venturers, Spire developed two new prototype solar instruments — the SPI-Laminator which provides void-free high reliability lamination and encapsulation of photovoltaic modules and the SPI-Solar Cell Interconnector System which is a semi-automatic solder reflow machine engineered specifically for fast, efficient interconnection of solar cells in photovoltaic modules.

Since the date of MTDC's investment, the company's line of credit with the First National Bank of Boston has been nearly doubled. Presently, the company is also negotiating with an equity investor from MTDC's original syndication to increase the investor's equity position in the company by ten percent.

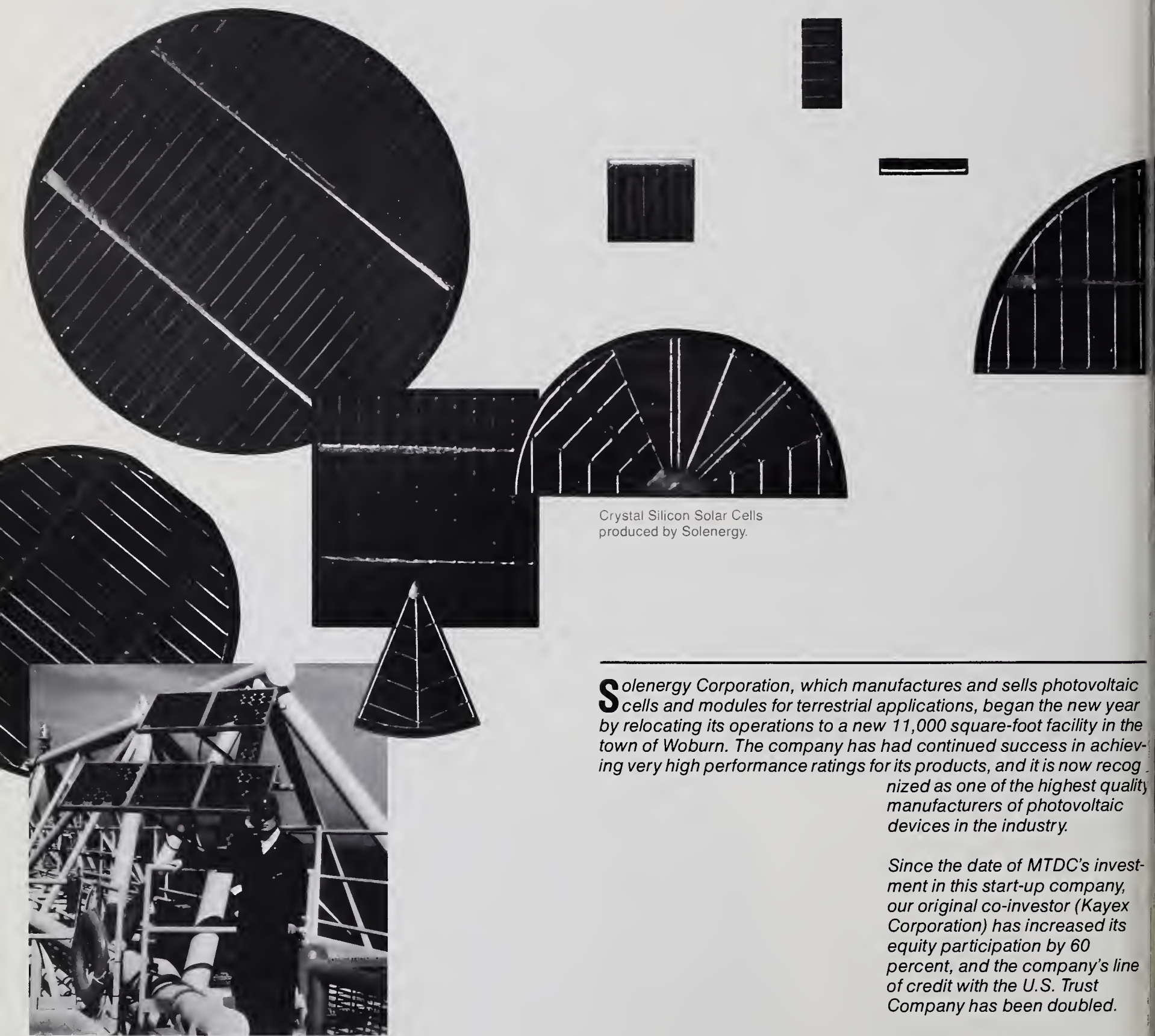
The Bedford-based company has grown so rapidly in the last year that it has had to expand its facilities and it now expects its 1981 job growth projection of 130 positions to be exceeded by a significant margin.



PI-Laminator series 100
photovoltaic Module
laminator.

Spire's Starburst™ Solar Cell.

Solenergy Corporation



Crystal Silicon Solar Cells
produced by Solenergy.

Solenergy Corporation, which manufactures and sells photovoltaic cells and modules for terrestrial applications, began the new year by relocating its operations to a new 11,000 square-foot facility in the town of Woburn. The company has had continued success in achieving very high performance ratings for its products, and it is now recognized as one of the highest quality manufacturers of photovoltaic devices in the industry.

Since the date of MTDC's investment in this start-up company, our original co-investor (Kayex Corporation) has increased its equity participation by 60 percent, and the company's line of credit with the U.S. Trust Company has been doubled.

We are pleased to report that because of the increased demand for alternative energy sources and successful world marketing of its products, Solenergy exceeded last year's goal for sales and is now striving to attain even more ambitious goals for 1982.

The 1264G Photo-Voltaic
System in operation on
offshore oil platform.

Massachusetts Technology Development Corporation:

We have examined the balance sheets of Massachusetts Technology Development Corporation as of June 30, 1981 and 1980 and the related statements of revenues, expenditures, and changes in fund balances for the years then ended. Our examinations were made in accordance with generally accepted auditing standards and, accordingly, included such tests of the accounting records and such other auditing procedures as we considered necessary in the circumstances.

In our opinion, the accompanying financial statements present fairly the financial position of the Corporation at June 30, 1981 and 1980 and its revenues, expenditures, and changes in fund balances for the years then ended, in conformity with generally accepted accounting principles applied on a consistent basis.

Deloitte Haskins + Sells

Deloitte Haskins & Sells
Boston, Massachusetts

August 14, 1981

Balance Sheets June 30, 1981 and 1980

	1981	1980
Assets		
General Support:		
Cash and cash equivalents	\$ 69,296	\$ 47,744
Interest receivable	6,700	7,556
Grant receivable	4,000	4,000
Prepaid expenses and deposits	3,249	2,756
Office equipment — at cost less accumulated depreciation of \$972 in 1981 and \$5,871 in 1980 ⁽²⁾	9,581	608
Total General Support	92,826	62,664
Restricted for Venture Development Programs: (2,3,4)		
Unexpended grant for revolving fund	672,000	1,022,000
Grants receivable	2,000,000	
Investments ^(2,4)	1,295,833	950,000
Cash	4,167	
Total Restricted	3,972,000	1,972,000
Total Assets	\$4,064,826	\$2,034,664

Liabilities and Fund Balances

General Support:		
Accrued liabilities	\$ 7,067	\$ 12,586
Capitalized lease payable	3,549	
Fund balance ⁽¹⁾	82,210	50,078
Total General Support	92,826	62,664
Restricted for Venture Development Programs:		
Fund balances ⁽³⁾	3,972,000	1,972,000
Total Liabilities and Fund Balances	\$4,064,826	\$2,034,664

See notes to financial statements.

*Statements of Revenues, Expenditures,
and Changes in Fund Balances
for the Years Ended June 30, 1981 and 1980*

	1981		1980	
	General Support	Restricted Funds	General Support	Restricted Funds
Revenues:				
Appropriation — Commonwealth of Massachusetts	\$190,000		\$190,000	
Grants:				
U.S. Department of Commerce ⁽³⁾		\$1,000,000		
Commonwealth of Massachusetts ⁽³⁾		1,000,000		
Northeast Solar Energy Center			6,000	
Department of Energy			9,800	
Contributions for Suspended Particulates Program				\$ 1,250
Interest earned ⁽²⁾	125,508		44,031	347
Miscellaneous	1,571		504	
Total Revenues	317,079	2,000,000	250,335	1,597
Expenditures:				
General Support ⁽⁷⁾	284,947		291,928	26,000
Suspended Particulates Program ⁽⁵⁾				19,306
Total Expenditures	284,947		291,928	45,306
Excess (Deficiency) of Revenues over Expenditures	32,132	2,000,000	(41,593)	(43,709)
Fund Balances, Beginning of Year	50,078	1,972,000	91,671	2,015,709
Fund Balances, End of Year	\$ 82,210	\$3,972,000	\$ 50,078	\$1,972,000

See notes to financial statements.

Notes

1. Organization, Operations, and General Support Funding

The Corporation came into existence on October 19, 1978 pursuant to Chapter 497 of the Acts of 1978 of the Commonwealth of Massachusetts. The purpose of the Corporation is to provide financial and other assistance to innovative enterprises in Massachusetts that have the potential to expand and generate new jobs and tax revenues. The Corporation is governed by a Board of Directors consisting of eleven members, eight of whom are appointed by the Governor from the private sector and three of whom are public officials.

The Corporation is successor to the Massachusetts Science and Technology Foundation (which was simultaneously dissolved) and assumed all rights, assets and liabilities of the Foundation. Appropriations from the Commonwealth have been a significant source of funding for both the Corporation and its predecessor. The appropriation acts impose an obligation to reimburse the Commonwealth for amounts appropriated; however, in 1972, the Massachusetts Attorney General issued an opinion that "such continued funding by the Commonwealth suggests that the Legislature is mindful that the Foundation requires state support until such time as it is able to be self-supporting." Accordingly, the liability to the Commonwealth, if any, is not included in the accompanying financial statements. Appropriations through the year ended June 30, 1981 total \$1,640,110, including \$190,000 for each of the years ended June 30, 1981 and 1980.

2. Summary of Significant Accounting Policies

Office Equipment

Office equipment is stated at cost and is being depreciated on a straight-line basis over estimated useful lives ranging from three to ten years.

Investments

Investments, which at June 30, 1981 and 1980 consist of notes receivable (Note 4), are carried at cost. Interest earned is credited to the Corporation's General Support Funds. Gains on investments, if any, will be credited to the Corporation's General Support Funds and losses, if any, will be charged against Restricted Fund Balances.

Income Taxes

The Corporation is an instrumentality of the Commonwealth and, as such, is not required to pay any federal or state income taxes.

3. Venture Development Programs

During the year ended June 30, 1979, the Corporation's original investment funds were provided by a \$2,000,000 grant awarded by the Economic Development Administration (EDA), U.S. Department of Commerce, under Title IX of the Public Works and Economic Development Act of 1965, as amended. Under this grant, which allowed for the expenditure of \$28,000 for start-up costs, the Corporation makes loans from a Revolving Loan Fund to eligible borrowers, defined as Massachusetts-based businesses with operations involving a significant amount of technology, which are located in EDA Title IV redevelopment areas and which meet the requirements of the Corporation's enabling act.

During the year ended June 30, 1981, the Corporation was awarded a \$1,000,000 grant under the Corporations for Innovation Development (CID) program of the U.S. Department of Commerce. The grant award is for the purpose of establishing another revolving loan fund to assist in the creation and development of small, innovative high-technology companies in Massachusetts. In addition, the Commonwealth of Massachusetts appropriated \$1,000,000 to the Corporation as matching funds for the federal grant. The Commonwealth appropriation will be used to establish a revolving equity investment fund which will be applied to the same purpose as the federally-funded revolving loan fund.

4. Investments

During the years ended June 30, 1981 and 1980, the Corporation made loans under its Venture Development Program to two corporations in an aggregate amount of \$350,000 and to five corporations in an aggregate amount of \$950,000, respectively. The terms of each note include an equity participation feature such as warrants to purchase common stock or royalties on gross sales or on net profits as well as interest due monthly at rates varying from 10% to 15.5% per year. Repayment of principal is due in monthly instalments over a five or six-year period commencing one or two years from the date of the loan. However, such principal payments are subordinated to the payment of certain senior debt of the borrowers.

5. Total Suspended Particulates (TSP) Program

In November 1979, the Corporation discontinued a program of its predecessor organization to make measurements and perform analysis of the total and respirable fractions of suspended particulates in their contribution to air pollution. The final activities of this program were recorded in the year ended June 30, 1980.

6. Office Facility Lease

The Corporation has lease commitments primarily for office space during the next fiscal year approximating \$21,765 per year. Rental expense for the years ended June 30, 1981 and 1980 aggregated \$23,000 and \$21,000, respectively.

7. General Support Expenditures

The Corporation's General Support Expenditures for the years ended June 30, 1981 and 1980 were as follows:

	1981	1980
Salaries and wages	\$146,769	\$161,943
Consultants' fees	30,000	51,388
Payroll taxes	6,076	10,308
Fringe benefits	16,691	16,875
Rent	23,144	21,783
Legal and accounting	23,069	22,786
Printing and advertising	8,048	
Office supplies and expense	7,560	7,387
Travel	7,175	8,578
Telephone	5,950	6,703
Copy machine	3,720	4,089
Electricity	2,142	1,491
Depreciation	1,025	209
Insurance	918	909
Books and periodicals	785	963
Postage	751	1,022
Dues and seminars	749	654
Miscellaneous expense	375	840
Total Expenditures	\$284,947	\$317,928
Allocation of expenditures:		
General support	\$284,947	\$291,928
Restricted		26,000
Total, as above	\$284,947	\$317,928

Board of Directors

Dr. Marvin G. Schorr
*Chairman of the Board
President, Tech/Ops, Inc.*

Joe B. Wyatt
*Vice Chairman of the Board
Vice President, Administration
Harvard University*

Honorable George S. Kariotis
Secretary of Economic Affairs

Orie L. Dudley, Jr.
*Investment Analyst
Endowment Management &
Research Corporation*

Dr. Judith H. Obermayer
*Vice President
Research & Planning, Inc.*

Honorable Thomas P. O'Neill, III
Lieutenant Governor

Dr. John R. Ehrenfeld
*Chemical Systems Section
Arthur D. Little, Inc.*

Dr. Robert C. Seamans, Jr.
*Dean, School of Engineering
Massachusetts Institute of
Technology*

Honorable Edward T. Hanley
*Secretary of Administration
and Finance*

Arthur M. Vash
Corporate Director

Joseph S. Iandiorio, Esquire
Patent Counsel



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- 1. Dr. Marvin G. Schorr
- 2. Joe B. Wyatt
- 3. Orie L. Dudley, Jr.
- 4. Dr. John R. Ehrenfeld
- 5. Honorable Edward T. Hanley
- 6. Joseph S. Iandiorio, Esq.
- 7. Honorable George S. Kariotis
- 8. Dr. Judith H. Obermayer
- 9. Honorable Thomas P. O'Neill, III
- 10. Dr. Robert C. Seamans, Jr.
- 11. Arthur M. Vash

Officers and Staff

William F. Aikman
President

Warren S. Berg
Secretary-Treasurer

Edward J. Russell
Public Information Officer

R. Stephen McCormack
Senior Investment Analyst

Gail M. Cormier
Administrative Assistant

David G. Hughes
Investment Analyst

Esther E. Larson
Office Manager

Robert J. Crowley
Financial Analyst

Marie B. Phaneuf
Secretary



Seated: Marie Phaneuf, Stephen McCormack, Robert Crowley, Esther Larson.
Standing: William Aikman, Edward Russell, Gail Cormier. Inset: Warren Berg.

Legal Counsel
*Palmer & Dodge
Boston, Massachusetts*

Accountants
*Ayers & Sheehan
Boston, Massachusetts*

Auditors
*Deloitte Haskins & Sells
Boston, Massachusetts*

Bankers
*Shawmut Bank of Boston, N.A.
Boston, Massachusetts*

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